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EXAMINER

VERDIER, CHRISTOPHER M

ART UNIT PAPER NUMBER

3745

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Please find below and/or attached an Office communication concerning this application or proceeding.

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<b>Office Action Summary</b>	<b>Application No.</b> 10/774,400	<b>Applicant(s)</b> LAGRANGE ET AL.	
	<b>Examiner</b> Christopher Verdier	<b>Art Unit</b> 3745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 17 November 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 and 3-40 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-40 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>7-15-05</u> . | 6) <input type="checkbox"/> Other: _____  |

Applicants' Amendment dated November 17, 2005 has been carefully considered but is deemed non-persuasive. Claims 1 and 3-40 are pending. The specification has been amended to correct the informalities noted in the Office action of June 17, 2005. The claims have been amended to overcome the informalities set forth in the Office action of June 17, 2005. The claims have been amended to overcome the rejections under 35 USC 112, second paragraph set forth in the Office action of June 17, 2005. Correction of these matters is noted with appreciation.

With regard to the rejection of claims 10-13, 21, 25, and 29-30 under 35 U.S.C. 102(b) as being anticipated by United Kingdom Patent 677,142, Applicant has amended independent claims 10, 11, and 29 to recite that the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets is greater than 40 degrees, and has stated that in the United Kingdom '142 patent, the corresponding angle is approximately 30 to 40 degrees. Applicant has argued that this recitation is patentably distinct from the arrangement disclosed in the United Kingdom '142 patent, because one half of the Applicant's angle 2E in figures 10 and 12 is 20.782 degrees, with the total angle being 41.564 degrees, and has argued that this angle is not a mere matter of choice in design, because the bottom tang does not lie along the same parallel angle along the face of the uppermost tangs in Applicant's invention. These arguments are not persuasive, because the specific angular values for the tangs on turbine buckets and the tangs on turbine wheel posts are known in the art to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to

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select the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets and wheelposts to be greater than 40 degrees, for the purpose of reducing/optimizing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). As stated in *In re Huang*, 100 F. 3d 135, 139, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996), it has been held that the court and its predecessors have long held that even though an applicant's modification results in great improvement and utility over the prior art, it may not be patentable if the modification was within the capabilities of one skilled in the art, unless the claimed range produces a new and unexpected result which is different in kind and not merely in degree from the results of the prior art. As stated in *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990), in cases in which the difference between the claimed invention and the prior art is some range or other variable, the applicant must generally shown that the particular range is critical, generally by showing that the claimed range produces new and unexpected results.

With regard to Applicant's argument that the bottom tang in the United Kingdom patent '142 does not lie along the same parallel angle along the face of the uppermost tangs in Applicant' invention, this feature is not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

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With regard to the rejection of claims 10-17, 21-25, and 29-32 under 35 U.S.C. 102(b) as being anticipated by Goodwin 4,260,331, Applicant has argued that Goodwin suffers from the same deficiency as does the United Kingdom patent '142, and has stated that in column 3 of Goodwin, the angle between the tangent lines along the opposite faces of the tang varies from 35 to 40 degrees, and that Applicant's invention patentably defines over Goodwin for the same reasons given above with respect to the United Kingdom '142 patent. These arguments are not persuasive for the same reasons above. The specific angular values for the tangs on turbine buckets and the tangs on turbine wheel posts are known in the art to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to select the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets and wheelposts in Goodwin to be greater than 40 degrees, for the purpose of reducing/optimizing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art.

Applicant's argument that amended independent claim 1 defines over Hill 2,755,062, because Hill does not have a symmetrical arrangement of fillets and tangs on either side of a centerline of the blade root portion, is persuasive. However, other references teach the subject matter of amended claim 1, as set forth later below.

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With regard to the rejection of claims 18-19, 26-27, and 33 under 35 U.S.C 103(a) as being unpatentable over Goodwin 4,260,331 as set forth in the previous Office action, Applicant has stated that Applicant disagrees with respect to the specific dimensions in the dependent claims being matters of choice in design. This argument is not persuasive for the reasons set forth in the case law cited above. The radii of curvature of curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet are known in the art to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to select the radii of curvature of the curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet to be specific values, such as .3762 inches and .5556 inches for the bucket bottom tang, and such as .3822 inches and 0.5616 inches for the wheelpost bottom fillet, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

It is noted that the original claims in copending application 10/774,399 do not conflict in terms of obviousness-type double patenting with the amended claims in the instant application, because the amended claims in copending application 10/774,399 have not been entered due to non-compliance with 37 CFR 1.121.

***Examiner's Suggestions to Claim Language***

The following are suggestions to improve the clarity and precision of the claims:

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In claim 10, line 3, "a plurality of" may be changed to -- sixty --.

In claim 10, line 3, "sixty" may be deleted.

In claim 11, line 3, "a plurality of" may be changed to -- sixty --.

In claim 11, line 3, "sixty" may be deleted.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 10-40 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Independent claims 10, 11, and 29 have been amended to recite that the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets is greater than 40 degrees (claim 10), to recite that the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the wheelposts is greater than 40 degrees (claim 11), and that the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets is greater than 40 degrees (claim 29). This is new matter, because Applicant's specification only has support for one-half of the angle 2E in figures 10 and 12 being 20.782 degrees, with the total angle being 41.564 degrees. The recitation of the angle being greater than 40 degrees adds new matter,

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because it includes ranges of values of the angle not disclosed in the specification (for example, an angle of 40.1 degrees, and any and all angles greater than 40 degrees, such as 50 degrees, 60 degrees, etc.)

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1 and 3-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang 6,450,770. Wang (figures 6 and 8) discloses a turbine 40 substantially as claimed having multiple turbine stages, with a first stage 42 and a second stage 44, with the second stage having a wheel having sixty broach slots with the wheel material between each adjacent pair of slots forming a wheelpost, each one of the wheelposts having an interleaved system of three fillets and

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three tangs symmetrically formed on either side of a center line along a longitudinal axis of each of the wheelposts, and sixty buckets 10 each having a corresponding interleaved system of three fillets and three tangs symmetrically formed on either side of a center line along a longitudinal axis of each of the buckets so that the sixty buckets can be fitted one to one into the sixty broach slots on the wheel, with the interleaved system of fillets and tangs on the buckets and wheelposts inherently reducing stresses acting on the fitted buckets and wheelposts. The buckets inherently fit into complementary wheelposts via the tang and fillets. Each of the buckets has a bottom tang formed from curved surfaces having more than one radius of curvature. Each of the buckets includes at least one straight surface. Each of the wheelposts has a bottom fillet formed from curved surfaces having more than one radius of curvature. Each of the wheelposts includes at least one straight surface.

However, Wang does not disclose the turbine is formed such that first stage wheel has sixty broach slots (claim 1), does not disclose the curved surfaces of the bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches (claim 7), and does not disclose the wheelpost bottom fillet having radii of curvatures of .3822 inches and 0.5616 inches (claim 8).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of Wang such that the first stage wheel has sixty broach slots, as a mere duplication of the arrangement of the first stage, because Wang discloses that the disclosed turbine provides acceptable efficiency with acceptable loads on the second stage wheel. One of ordinary skill in the art would have recognized that the number of broach

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slots disclosed by Wang would also be applicable to the first stage wheel, for the purpose of providing a gas turbine engine of acceptable efficiency with acceptable loads on the first stage wheel.

The recitation in claim 7 of the curved surfaces of the bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches, and the recitation in claim 8 of the wheelpost bottom fillet having radii of curvatures of .3822 inches and 0.5616 inches are deemed to be matters of choice in design. The radii of curvature of curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet are known in the art to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to select the radii of curvature of the curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet to be specific values, such as .3762 inches and .5556 inches for the bucket bottom tang, and such as .3822 inches and 0.5616 inches for the wheelpost bottom fillet, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 1 and 3-8 are also rejected under 35 U.S.C. 103(a) as being unpatentable over European Patent 1,296,022 in view of Wang 6,450,770. The European Patent discloses a turbine substantially as claimed having multiple turbine stages, with an unnumbered first stage and an unnumbered second stage, with the second stage having a wheel 22 having broach slots 20/26

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with the wheel material between each adjacent pair of slots forming a wheelpost, each one of the wheelposts having an interleaved system of three fillets and three tangs 14, 16 symmetrically formed on either side of a center line along a longitudinal axis of each of the wheelposts, and buckets 12 each having a corresponding interleaved system of three fillets and three tangs 14, 16 symmetrically formed on either side of a center line along a longitudinal axis of each of the buckets so that the buckets can be fitted one to one into the broach slots on the wheel, with the interleaved system of fillets and tangs on the buckets and wheelposts reducing stresses acting on the fitted buckets and wheelposts. Each of the buckets has a bottom tang formed from curved surfaces having more than one radius of curvature. Each of the buckets includes at least one straight surface (corresponding to 24). Each of the wheelposts has a bottom fillet formed from curved surfaces having more than one radius of curvature. Each of the wheelposts includes at least one straight surface 24.

However, the European Patent does not disclose the turbine is formed such that first stage wheel and the second stage wheel each have sixty broach slots (claim 1), does not disclose the curved surfaces of the bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches (claim 7), and does not disclose the wheelpost bottom fillet having radii of curvatures of .3822 inches and 0.5616 inches (claim 8).

Wang (figures 1 and 8) shows a turbine near 40, having plural stages having a first stage wheel 42 and a second stage wheel 44, with the number of buckets on the second stage wheel

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being sixty, for the purpose of providing a turbine of providing a gas turbine engine of acceptable efficiency with acceptable loads on the second stage wheel.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of the European Patent such that the second stage wheel has sixty broach slots, as taught by Wang. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of the European Patent such that the first stage wheel has sixty broach slots, as a mere duplication of the arrangement of the second stage, because one of ordinary skill in the art would have recognized that the number of broach slots disclosed by Wang would also be applicable to the first stage wheel, for the purpose of also providing a gas turbine engine of acceptable efficiency with acceptable loads on the first stage wheel.

The recitation in claim 7 of the curved surfaces of the bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches, and the recitation in claim 8 of the wheelpost bottom fillet having radii of curvatures of .3822 inches and 0.5616 inches are deemed to be matters of choice in design. The radii of curvature of curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet are known in the art to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to select the radii of curvature of the curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet to be specific values, such as .3762 inches and .5556 inches for the

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bucket bottom tang, and such as .3822 inches and 0.5616 inches for the wheelpost bottom fillet, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang 6,450,770 as applied to claim 1 above, and further in view of Caruso 6,030,178. The modified turbine of Wang shows all of the claimed subject matter as set forth above, including wheelposts, but does not show that the outer tang edge of each wheelpost is scalloped so as to reduce the weight of the turbine wheel.

Caruso (figure 1) shows a turbine wheel 10 having wheelposts shown generally at 12, which are formed such that an unnumbered outer tang edge of each wheelpost is scalloped, for the inherent purpose of reducing weight of the turbine wheel.

It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to form the modified turbine of Wang such that the outer tang edge of each wheelpost is scalloped, as taught by Caruso, for the purpose of reducing weight of the turbine wheel.

Claim 9 is also rejected under 35 U.S.C. 103(a) as being unpatentable over European Patent 1,296,022 and Wang 6,450,770 as applied to claim 1 above, and further in view of Caruso

6,030,178. The modified turbine of the European Patent shows all of the claimed subject matter as set forth above, including wheelposts, but does not show that the outer tang edge of each wheelpost is scalloped so as to reduce the weight of the turbine wheel.

Caruso (figure 1) shows a turbine wheel 10 having wheelposts shown generally at 12, which are formed such that an unnumbered outer tang edge of each wheelpost is scalloped, for the inherent purpose of reducing weight of the turbine wheel.

It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to form the modified turbine of the European Patent such that the outer tang edge of each wheelpost is scalloped, as taught by Caruso, for the purpose of reducing weight of the turbine wheel.

Claims 10-13, 21, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over United Kingdom Patent 677,142 in view of By 6,461,110. The United Kingdom Patent (figures 1-2) discloses a turbine substantially as claimed comprising an unnumbered wheel (the rotor disc) having plural unnumbered broach slots (which complement the firtree shape of the blade roots 1), each having an unnumbered interleaved system of fillets and tangs (which complement the firtree shape of the blade roots 1), plural unnumbered buckets each having a corresponding interleaved system of unnumbered fillets and tangs 4 so that the plural buckets can be fitted, one to one, into the plural broach slots on the wheel, with the interleaved system of fillets and tangs on the buckets and unnumbered wheelposts inherently acting to reduce stresses acting on the

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fitted buckets and wheelposts (due to the fir-tree shape), the fillets and tangs of the interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces, with the fillets formed on the plural buckets and the fillets formed on the plural wheelposts having angles of 55 degrees. There may be three interleaved tangs. Each of the wheelposts includes two unnumbered straight surfaces (which complement the fir-tree shape of the blade roots 1). An angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets is 40 degrees, and an angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the wheelposts is 40 degrees.

However, the United Kingdom Patent does not disclose that the turbine is formed such that first and second stages each have a wheel having sixty broach slots (claims 10-11), with the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets being greater than 40 degrees (claim 10), and does not disclose that the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the wheelposts is greater than 40 degrees (claim 11).

By (figures 1 and 8) shows a turbine near 40, having plural stages having a first stage wheel 44 and a second stage wheel 42, with the number of buckets on the first stage wheel being sixty, for the purpose of providing a turbine of providing a gas turbine engine of acceptable efficiency with acceptable loads on the first stage wheel.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of the United Kingdom Patent such that a first stage wheel has sixty broach slots, as taught by By. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of the United Kingdom Patent such that it includes a second stage wheel having sixty broach slots, as a mere duplication of the arrangement of the first stage, because one of ordinary skill in the art would have recognized that the number of broach slots disclosed by By would also be applicable to the second stage wheel, for the purpose of also providing a gas turbine engine of acceptable efficiency with acceptable loads on the second stage wheel.

The recitation of the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets being greater than 40 degrees (claim 10), and of the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the wheelposts being greater than 40 degrees (claim 11) are matters of choice in design. The specific angular values for the tangs on turbine buckets and the tangs on turbine wheel posts are known in the art to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to select the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets and wheelposts to be greater than 40 degrees, for the purpose of reducing/optimizing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum

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value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 10-17 and 21-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goodwin 4,260,331 in view of By 6,461,110. Goodwin discloses a turbine substantially as claimed, comprising a wheel 15 (the rotor disc) having plural broach slots 17, each having an interleaved system of fillets and tangs (corresponding to the fillets 32 of the blade roots 18 and tangs 22 of the blade roots 18), and plural buckets 16 each having a corresponding interleaved system of fillets 32 and tangs 22 so that the plural buckets can be filled, one to one, into the plural broach slots, with the interleaved system of fillets and tangs on the buckets and unnumbered wheelposts (near 15 in figure 2 and located between adjacent slots 17) inherently acting to reduce stresses acting on the fitted buckets and wheelposts (due to the firtree shape), the fillets and tangs of the interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces, with the fillets formed on the plural buckets and the fillets formed on the plural wheelposts having angles of 54 degrees (the table in column 3, examples 7 and 8). Although the buckets and wheelposts have seven interleaved tangs and fillets (the table in column 3, examples 7 and 8), the buckets and wheelposts meet the limitation of having three interleaved tangs and fillets. As seen in figure 2, each of the buckets has a bottommost tang formed from unnumbered curved surfaces having more than one radius of curvature (at the bottom of the tang and the top of the tang). As seen in figure 3, each buckets has straight surfaces 29, 30. As seen in figure 2, each of the wheelposts has an unnumbered bottom fillet near 35 formed from curved surfaces having more than one radius of curvature (at

the bottom and at the top). Each wheelpost includes unnumbered straight surfaces corresponding to the straight surfaces 29, 30 of the buckets. An angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets is from 35 to 40 degrees, and an angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the wheelposts is from 35 to 40 degrees, as shown in table in column 3.

However, Goodwin does not disclose that the turbine is formed such that first and second stages each have a wheel having sixty broach slots (claims 10-11), with the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets being greater than 40 degrees (claim 10), and does not disclose that the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the wheelposts is greater than 40 degrees (claim 11).

By (figures 1 and 8) shows a turbine near 40, having plural stages having a first stage wheel 44 and a second stage wheel 42, with the number of buckets on the first stage wheel being sixty, for the purpose of providing a turbine of providing a gas turbine engine of acceptable efficiency with acceptable loads on the first stage wheel.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of Goodwin such that a first stage wheel has sixty broach slots, as taught by By. It would have been obvious at the time the invention was made to

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a person having ordinary skill in the art to form the turbine of Goodwin such that it includes a second stage wheel having sixty broach slots, as a mere duplication of the arrangement of the first stage, because one of ordinary skill in the art would have recognized that the number of broach slots disclosed by By would also be applicable to the second stage wheel, for the purpose of also providing a gas turbine engine of acceptable efficiency with acceptable loads on the second stage wheel.

The recitation of the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets being greater than 40 degrees (claim 10), and of the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the wheelposts being greater than 40 degrees (claim 11) are matters of choice in design. The specific angular values for the tangs on turbine buckets and the tangs on turbine wheel posts are known in the art to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to select the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets and wheelposts to be greater than 40 degrees, for the purpose of reducing/optimizing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 14-19, 22-24, and 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over United Kingdom Patent 677,142 and By 6,461,110 as applied to claims 10 and 11 above, and further in view of Johnson 5,147,180. The modified turbine of United Kingdom Patent 677,142 shows all of the claimed subject matter, including the buckets including straight surfaces, and the wheelposts including straight surfaces, but does not show the buckets having a bottom tang formed from curved surfaces having more than one radius of curvature (claims 14 and 22), does not show the wheelposts having a bottom fillet formed from curved surfaces having more than one radius of curvature (claims 16 and 24), does not show the curved surfaces of the bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches (claims 18 and 26), and does not show the wheelpost bottom fillet having radii of curvatures of .3822 inches and 0.5616 inches (claims 19 and 27).

Johnson shows a turbine blade 10 having unnumbered buckets, with the buckets having a bottom tang 32 formed from curved surfaces having more than one radius of curvature R11, R12, with wheelposts (see figure 2) having a bottom fillet formed from curved surfaces having more than one radius of curvature that complement the radius of curvature R11, R12, for the purpose of minimizing peak blade root and groove stresses.

It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to form the modified turbine of United Kingdom Patent 677,142 such that the buckets have the bottom tang formed from curved surfaces having more than one radius of curvature, such that the wheelposts have the bottom fillet formed from curved surfaces having

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more than one radius of curvature, such that the upper tang is formed from curved surfaces having more than one radius of curvature, and such that the intermediate tang is formed from curved surfaces having more than one radius of curvature, as taught by Johnson, for the purpose of minimizing peak blade root and groove stresses.

The recitation of the curved surfaces of the bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches, and the recitation of the wheelpost bottom fillet having radii of curvatures of .3822 inches and 0.5616 inches are deemed to be matters of choice in design. The radii of curvature of curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet are recognized by Johnson to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to select the radii of curvature of the curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet to be specific values, such as .3762 inches and .5556 inches for the bucket bottom tang, and such as .3822 inches and 0.5616 inches for the wheelpost bottom fillet, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 18-19 and 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goodwin 4,260,331 and By 6,461,110 as applied to claims 10 and 11 above. The modified turbine of Goodwin show all of the claimed subject matter except for the curved surfaces of the

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bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches (claims 18 and 26), and except for the wheelpost bottom fillet having radii of curvatures of .3822 inches and 0.5616 inches (claims 19 and 27).

The recitation of the curved surfaces of the bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches, and the recitation of the wheelpost bottom fillet having radii of curvatures of .3822 inches and 0.5616 inches are deemed to be matters of choice in design. The radii of curvature of curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet are known in the art to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to select the radii of curvature in the modified turbine of Goodwin such that the radii of curvature of the curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet are specific values, such as .3762 inches and .5556 inches for the bucket bottom tang, and such as .3822 inches and 0.5616 inches for the wheelpost bottom fillet, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 20 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over United Kingdom Patent 677,142 and By 6,461,110 as applied to claims 10 and 11 above, and further in view of Caruso 6,030,178. The modified turbine of United Kingdom Patent 677,142 shows all

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of the claimed subject matter, including unnumbered wheelposts, but does not show that the outer tang edge of each wheelpost is scalloped so as to reduce the weight of the turbine wheel.

Caruso (figure 1) shows a turbine wheel 10 having wheelposts shown generally at 12, which are formed such that an unnumbered outer tang edge of each wheelpost is scalloped, for the inherent purpose of reducing weight of the turbine wheel.

It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to form the modified turbine of United Kingdom Patent 677,142 such that the outer tang edge of each wheelpost is scalloped, as taught by Caruso, for the purpose of reducing weight of the turbine wheel.

Claims 29-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over United Kingdom Patent 677,142. The United Kingdom Patent (figures 1-2) discloses a turbine substantially as claimed comprising an unnumbered wheel (the rotor disc) having plural unnumbered broach slots (which complement the firtree shape of the blade roots 1) and wheelposts, each having an unnumbered interleaved system of fillets and tangs (which complement the firtree shape of the blade roots 1), plural unnumbered buckets each having a corresponding interleaved system of unnumbered fillets and tangs 4 so that the plural buckets can be fitted, one to one, into the plural broach slots on the wheel, the fillets and tangs of the interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces. There may be three interleaved tangs. An angle formed by tangent lines along

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the uppermost tangs on either side of a center line bisecting each of the buckets is 40 degrees.

The recitation that the bucket may be inserted into a wheelpost of a turbine rotor of a first or second stage turbine is a recitation of intended use. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

However, the United Kingdom Patent does not disclose that the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets is greater than 40 degrees.

The recitation of the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets being greater than 40 degrees is a matter of choice in design. The specific angular values for the tangs on turbine buckets and the tangs on turbine wheel posts are known in the art to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to select the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets to be greater than 40 degrees, for the purpose of reducing/optimizing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 31-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over United Kingdom Patent 677,142 as applied to claim 30 above, and further in view of Johnson 5,147,180. The modified turbine of United Kingdom Patent 677,142 shows all of the claimed subject matter, with the buckets including straight surfaces, and the wheelposts including straight surfaces, but does not show the bucket having a bottom tang formed from curved surfaces having more than one radius of curvature (claim 31), does not show the curved surfaces of the bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches (claim 33), does not show the bucket having an upper tang formed from curved surfaces having more than one radius of curvature (claims 34-35), and does not show the bucket having an intermediate tang formed from curved surfaces having more than one radius of curvature (claims 37-39).

Johnson shows a turbine blade 10 having unnumbered buckets, with the buckets having a bottom tang 32 formed from curved surfaces having more than one radius of curvature R11, R12, and with an upper tang 28 formed from curved surfaces having more than one radius of curvature R3, R4, and with an intermediate tang 30 formed from curved surfaces having more than one radius of curvature R7, R8, for the purpose of minimizing peak blade root and groove stresses.

It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to form the modified turbine of United Kingdom Patent 677,142 such that the buckets have the bottom tang formed from curved surfaces having more than one radius of curvature, such that the upper tang is formed from curved surfaces having more than one radius

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of curvature, and such that the intermediate tang is formed from curved surfaces having more than one radius of curvature, as taught by Johnson, for the purpose of minimizing peak blade root and groove stresses.

The recitation of the curved surfaces of the bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches are deemed to be matters of choice in design. The radii of curvature of curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet are recognized by Johnson to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to select the radii of curvature of the curved surfaces of the bucket bottom tang to be specific values, such as .3762 inches and .5556 inches for the bucket bottom tang, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 29-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goodwin 4,260,331. Goodwin discloses a turbine substantially as claimed, comprising a wheel 15 (the rotor disc) having plural broach slots 17 and unnumbered wheelposts, each having an interleaved system of fillets and tangs (corresponding to the fillets 32 of the blade roots 18 and tangs 22 of the blade roots 18), and plural buckets 16 each having a corresponding interleaved system of fillets 32 and tangs 22 so that the plural buckets can be filled, one to one, into the plural broach slots, with the interleaved system of fillets and tangs on the buckets and unnumbered wheelposts

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(near 15 in figure 2 and located between adjacent slots 17), the fillets and tangs of the interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces.

Although the buckets and wheelposts have seven interleaved tangs and fillets (the table in column 3, examples 7 and 8), the buckets and wheelposts meet the limitation of having three interleaved tangs and fillets. As seen in figure 2, each of the buckets has a bottommost tang formed from unnumbered curved surfaces having more than one radius of curvature (at the bottom of the tang and the top of the tang). As seen in figure 3, each buckets has straight surfaces 29, 30. As seen in figure 2, each of the wheelposts has an unnumbered bottom fillet near 35 formed from curved surfaces having more than one radius of curvature (at the bottom and at the top). Each wheelpost includes unnumbered straight surfaces corresponding to the straight surfaces 29, 30 of the buckets. An angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets is from 35 to 40 degrees, as shown in table in column 3. The recitation that the bucket may be inserted into a wheelpost of a turbine rotor of a first or second stage turbine is a recitation of intended use. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

However, Goodwin does not disclose that the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets is greater than 40 degrees (claim 29), and does not disclose the curved surfaces of the bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches (claim 33).

The recitation of the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets being greater than 40 degrees is a matter of choice in design. The specific angular values for the tangs on turbine buckets are known in the art to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to select the angle formed by tangent lines along the uppermost tangs on either side of a center line bisecting each of the buckets to be greater than 40 degrees, for the purpose of reducing/optimizing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

The recitation of the curved surfaces of the bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches is a matter of choice in design. The radii of curvature of curved surfaces of the bucket bottom tang are known in the art to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to select the radii of curvature of the curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet to be specific values, such as .3762 inches and .5556 inches for the bucket bottom tang, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

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Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

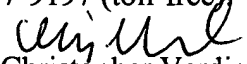
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher Verdier whose telephone number is (571) 272-4824. The examiner can normally be reached on Monday-Friday from 10:00-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward K. Look can be reached on (571) 272-4820. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

C.V.  
February 1, 2006

  
Christopher Verdier  
Primary Examiner  
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